Lower Columbia River TGP Risk

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TGP at Keenleyside (Past Practice)

- 1995 TGP model developed for HLK
- 1996 BC Hydro develops LOO for HLK to minimize TGP under the various discharge scenarios.
- Provincial Guideline established in 1997 (110%).
- TGP (Percent Saturation) used when discussing impacts to fish with agencies/others.
- Water Use Plan first uses three performance measure to assess risk (spill, % saturation).

Rationale for Developing GBT Risk

- The Technical Committee required a descriptive TGP Performance Measure that assessed WUP Operating Alternatives **impact to fish** (GBT risk at a given level of TGP and exposure duration).
  - Dynamic Exposure (exposure not constant)
  - Temperature effects
  - Fish behaviour (Large river - not Lab)

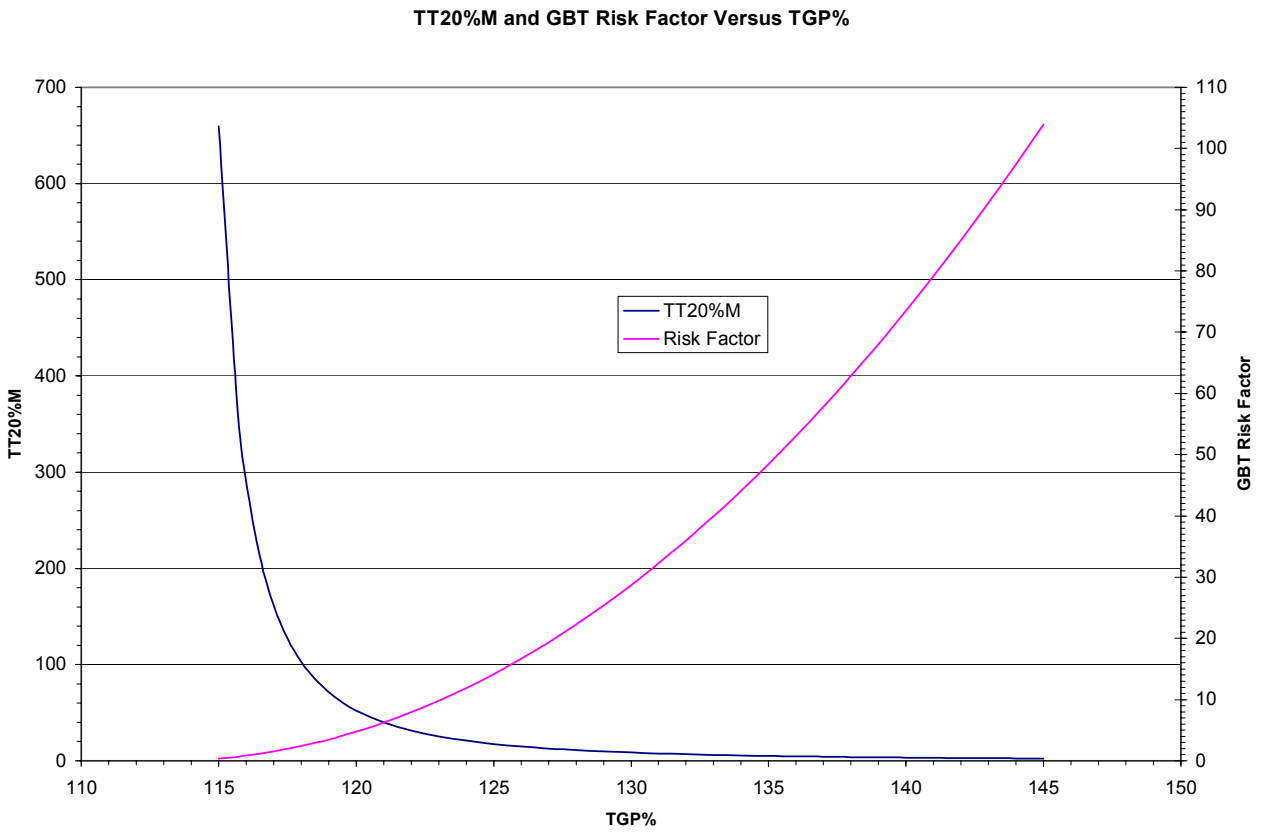
GBT Risk

- GBT Risk is a relative risk factor - uses time to 20% mortality, combined with temperature influence.
  - Used rainbow trout data from literature as well as recent study results by (Antcliffe, Fidler, and Birtwell 2001).
  - Temperature used - Time to mortality decreases as temperature rises

GBT Risk (continued)

- A lower theshold limit of 115% was set as the limit in the river environment below which no GBT risk was likely.
- Risk factor does not take into account depth behaviour of fish, but assumes fish behaviour unchanged across alternatives.

TT20%Mortality and GBT Risk



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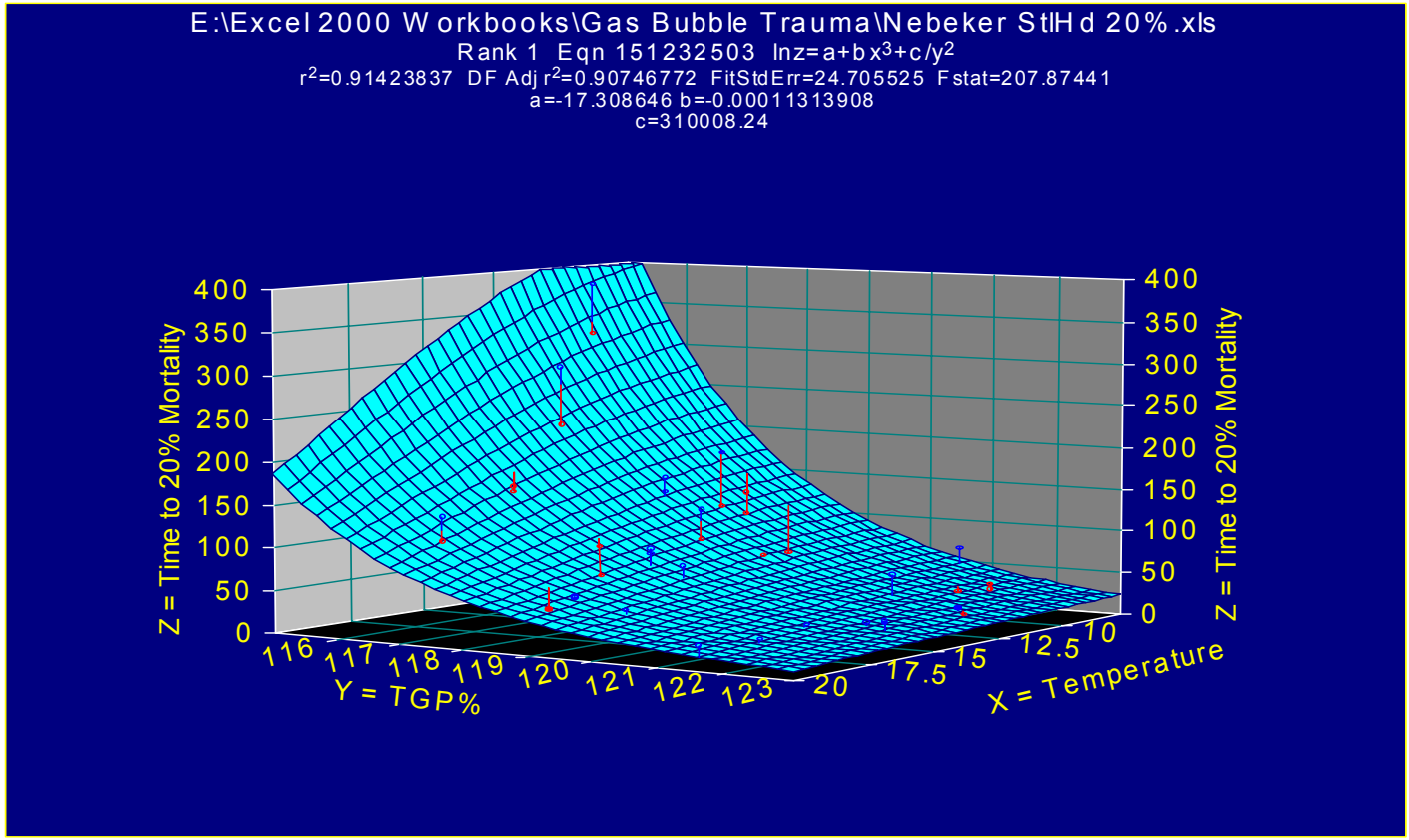
TT 20% Mortality vs Temperature



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GBT Risk Assessment Calculation

- Created a lookup table of TGP (% saturation) under a variety of heads and discharges so that the HLK TGP model didn't have to be run for 15 years of data.
- Monthly WUP model output overlain with daily perturbations to develop estimate of what could happen on any day. Excel spreadsheet developed to calculate daily average TGP for full range of alternatives.

Results of TGP Risk Assessment

HLK and ALGS				
	Base Case	Alt 7B 1MAF	Alt 7B 2MAF	Alt 11B
# days head differential > 17m	1041	1807	1201	486
average head differential (m)	12.5	14.4	14.2	12.1
# days over all 15 years above 115%	170	92	193	39
# days over all 15 years above 120%	12	18	26	1
ave TGP June, July, August across 15 year	109	108	109	107
total GBT risk (115%), summed over all 15 years	531	337	545	92
total GBT risk (120%), summed over all 15 years	114	182	194	6
HLK only - no ALGS influence				
	Base Case	Alt 7B 1MAF	Alt 7B 2MAF	Alt 11B
# days head differential > 17m	1041	1807	1201	486
average head differential (m)	12.5	14.4	14.2	12.1
# days over all 15 years above 115%	730	1527	849	298
# days over all 15 years above 120%	528	1451	534	232
ave TGP June, July, August across 15 year	115	121	109	110
total GBT risk (115%), summed over all 15 years	33796	98594	32195	11550
total GBT risk (120%), summed over all 15 years	33336	98418	31479	11343

Conclusion

- The TGP Risk Assessment methodology developed for the Columbia River below Keenleyside Dam provided an acceptable indicator of GBT risk
- Limitations in approach identified.
- No significant differences in risk were identified between Water Use Plan alternatives.

MCA WUP Alternatives

- Alternatives:
  - Base Case - Treaty Operation Only
  - Alternative 7 - Lower Columbia River Fish Friendly
    - Alternatives using 1 and 2 million ac ft of storage under Treaty to accomplish rainbow trout, whitefish and sturgeon objectives
    - WUP committee will likely drop Alt 7 and concentrate on Alt 11 with recommendations (wf, rb, sturgeon) for Lower Columbia River.
  - Alt 11 - Arrow Reservoir Management
    - 11B - holds Arrow lower for longer in spring to improve vegetation, large river habitat (REV) and bird habitat
    - 11D - allows reservoir earlier rise than 11B but pushes reservoir down in fall for vegetation protection.